NASA Langley Research Center
Center Innovation Fund

Light weight Telescope Systems
Using Novel Nano-layered Synthesized Materials

Dr. Natalie Clark
Electronics Engineer

Because today's large telescopes typically weigh two thousand pounds or more, researchers are exploring novel methods to reduce their weight for space-based missions.

One such researcher is Natalie Clark who works at NASA Langley Researcher Center. Recently, Clark received Center Innovation Funding to study ways of using a diffraction technology that would allow an entire telescope to be fabricated with a very thin plate. The plate would be orders of magnitude a thousand times lighter than a large telescope.

According to Clark, "the trick that we're doing to make these thin telescopes is putting in nano layers. It's really hard to get a material to have all of the properties that you want – for example, index refraction, CTE (thermal expansion coefficient). What we can do is layer many layers at the atomic or angstrom level and get the property that we want for the system."

Since diffractive telescopes have problems with colors of light, she has already created a sample corrector plate.

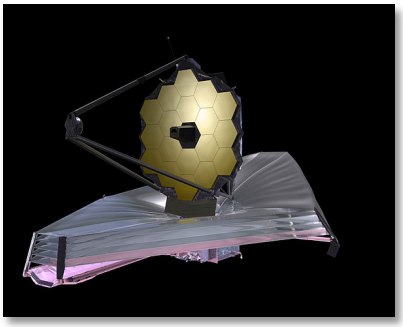
Clean room at NASA Langley

"The corrector plate will allow all the colors to get refracted and be brought together so you could see one image with all the spectral combinations in the image, so it would be sharp."

Clark is investigating ways to modulate the technology to control irradiance, phase, polarization and spectral properties of light.

"With adaptive optics, we could, for example, scan through the colors. Maybe for a hyperspectral imager, we could turn what would normally be a disadvantage into an advantage."

NASA is interested in the technology for planetary science and for solar physics, where they need 10- and 20-meter telescopes.

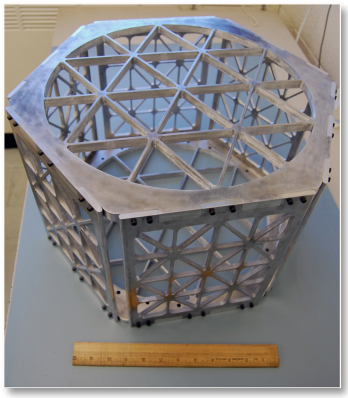


Artist concept of James Webb space telescope

So, Clark is teaming with scientists at NASA's Goddard Space Flight Center to advance the technology. The scientists would like to conduct a flight experiment for heliophysics.

"If we can get a small sat or something sort of feasibility project, we could verify the technology in the field to get it up to a higher TRL number. Right now, we're probably at TRL 2. We'd like to get it to TRL 4 or 5.

She is also working with another Langley researcher, Dr. Stephen Horan. Horan, another CIF recipient is investigating small satellites. Together, they hope to incorporate Clark's instrumentation into a small demonstration satellite.



Model nanosatellite structure, S. Horan